What is claimed is:

1. A DNA chip comprising a solid carrier and a plurality of DNA fragments fixed onto the solid carrier at each one end, wherein a plurality of short chain spacer molecules having a hydrophilic moiety at each one end are fixed at each another end onto a surface area of the solid carrier having no DNA fragments thereon.

2. The DNA chip of claim 1, wherein the solid carrier is an electro-conductive substrate.

3. The DNA chip of claim 1, wherein the DNA fragments are fixed onto the solid carrier in an amount of 10^{-20} to 10^{-12} mol./mm^2.

4. The DNA chip of claim 1, wherein the hydrophilic moiety of the spacer molecule is a hydroxyl group.

5. The DNA chip of claim 1, wherein the spacer molecule is fixed onto the solid carrier through a mercapto moiety attached to the end of the spacer molecule.

6. The DNA chip of claim 1, wherein the spacer molecule is derived from a compound selected from the group consisting of 2-mercaptoethanol, 3-mercaptoethanol, 6-mercaptoethanol, and N,N'-di(3-hydroxy-n-propyl)-imidazole-2-thione.

7. A process for preparing a DNA chip of claim 1 which comprises the steps of:

applying onto a solid carrier an aqueous solution of a plurality of DNA fragments dissolved or dispersed in an aqueous medium to fix the DNA fragments onto the solid carrier; and

applying onto the solid carrier having thereon the fixed DNA fragments an aqueous solution of short chain spacer molecules having at each one end a hydrophilic moiety and at each another end a moiety reactive to fix to the solid carrier.

8. A method of quantitative analysis of a nucleic acid fragment contained in a sample liquid which is complementary to the DNA fragments of the DNA chip of claim 2, which comprises the steps of:

adjusting the concentration of the nucleic acid fragment in the sample liquid so that a droplet of the sample liquid applied to the DNA chip should contain 10^{-20} to 10^{-16} mol. of the nucleic acid fragment per 1 mm^2 of the surface of the electro-conductive substrate of the DNA chip;

bringing the nucleic acid concentration-adjusted sample liquid into contact with the DNA chip, whereby hybridizing the nucleic acid with the DNA fragment on the DNA chip;

bringing an electrochemically active molecule in contact with the hybridized nucleic acid and DNA fragment, whereby attaching the electrochemically active molecule to the hybridized nucleic acid and DNA fragment;

applying a potential to the DNA chip; and

measuring an electric current flowing from or to the electro-conductive substrate through the attached electrochemically active molecule.

9. A kit for conducting quantitative analysis of a nucleic acid fragment contained in a sample liquid which is complementary to the DNA fragments of the DNA chip of claim 2, which comprises the DNA chip of claim 2 and an electrochemically active molecule which is attachable to a hybridized nucleic acid and DNA fragment.

10. A PNA chip comprising a solid carrier and a plurality of PNA fragments fixed onto the solid carrier at each one end, wherein a plurality of short chain spacer molecules having a hydrophilic moiety at each one end are fixed at each another end onto a surface area of the solid carrier having no PNA fragments thereon.

11. The PNA chip of claim 10, wherein the solid carrier is an electro-conductive substrate.

12. The PNA chip of claim 10, wherein the DNA fragments are fixed onto the solid carrier in an amount of 10^{-20} to 10^{-12} mol./mm^2.

13. The PNA chip of claim 10, wherein the hydrophilic moiety of the spacer molecule is a hydroxyl group.

14. The PNA chip of claim 10, wherein the spacer molecule is fixed onto the solid carrier through a mercapto moiety attached to the end of the spacer molecule.

15. The PNA chip of claim 10, wherein the spacer molecule is derived from a compound selected from the group consisting of 2-mercaptoethanol, 3-mercaptoethanol, 6-mercaptoethanol, and N,N'-di(3-hydroxy-n-propyl)-imidazole-2-thione.

16. A process for preparing a PNA chip of claim 10 which comprises the steps of:

applying onto a solid carrier an aqueous solution of a plurality of PNA fragments dissolved or dispersed in an aqueous medium to fix the PNA fragments onto the solid carrier; and

applying onto the solid carrier having thereon the fixed PNA fragments an aqueous solution of short chain

spacer molecules having at each one end a hydrophilic moiety and at each another end a moiety reactive to fix to the solid carrier.

17. A method of quantitative analysis of a nucleic acid fragment contained in a sample liquid which is complementary to the PNA fragments of the PNA chip of claim 11, which comprises the steps of:

adjusting the concentration of the nucleic acid fragment in the sample liquid so that a droplet of the sample liquid applied to the PNA chip should contain 10^{-20} to 10^{-16} mol. of the nucleic acid fragment per 1 mm^2 of the surface of the electro-conductive substrate of the PNA chip;

bringing the nucleic acid concentration-adjusted sample liquid into contact with the PNA chip, whereby hybridizing the nucleic acid with the PNA fragment on the PNA chip;

bringing an electrochemically active molecule in contact with the hybridized nucleic acid and PNA fragment, whereby attaching the electrochemically active molecule to the hybridized nucleic acid and PNA fragment;

applying a potential to the PNA chip; and

measuring an electric current flowing from or to the electro-conductive substrate through the attached electrochemically active molecule.

18. A kit for conducting quantitative analysis of a nucleic acid fragment contained in a sample liquid which is complementary to the PNA fragments of the PNA chip of claim 11, which comprises the PNA chip of claim 11 and an electrochemically active molecule which is attachable to a hybridized nucleic acid and PNA fragment.